

CLAIMS

What is claimed is:

1 1. A method for conducting a hearing test using a computer program, comprising:
2 establishing a communication channel between a remote device and a server in a
3 communication network;
4 executing a first component of the computer program at the server; and
5 executing a second component of the computer program at the remote device, wherein
6 the computer program comprises a routine that manage interaction via an interface on the remote
7 device, and adaptively select stimuli based upon said interaction to be produced at the remote
8 device for said interaction according to a convergent process to determine a hearing
9 characteristic.

1 2. The method of claim 1, wherein said interaction comprises an N-alternative
2 forced choice interaction.

1 3. The method of claim 1, wherein the communication network comprises a packet
2 switched network.

1 4. The method of claim 1, wherein the communication network comprises a network
2 executing according a standard internet protocol.

1 5. The method of claim 1, wherein the channel comprises a connection according to
2 a standard transmission control protocol over a standard internet protocol (TCP/IP).

1 6. The method of claim 1, wherein the channel comprises a link through a cellular
2 telephone network.

1 7. The method of claim 1, wherein the channel comprises a link through a pager
2 network.

1 8. The method of claim 1, wherein the remote device comprises a mobile phone.

1 9. The method of claim 1, wherein the remote device comprises a home computer.

1 10. The method of claim 1, wherein the remote device comprises a hand held
2 computing platform.

1 11. The method of claim 1, wherein said routine to manage interaction includes:
2 logic providing graphic constructs for display at the device corresponding to each of N
3 alternative stimulus intervals, the graphic constructs being aligned in an up and down
4 relationship, causing generation of a selected stimulus during one of the N alternative stimulus
5 intervals, and prompting the subject to make a choice by selecting a graphic construct using an
6 input device indicating the user's perception of the stimulus during said N alternative stimulus
7 intervals.

1 12. The method of claim 1, wherein said routine to manage interaction includes:
2 causing a visual effect at the device corresponding to each of N alternative stimulus
3 intervals, causing generation of a selected stimulus during one of the N alternative stimulus
4 intervals, and prompting the subject to make a choice by selecting a visual effect indicating the
5 user's perception of the stimulus during said N alternative stimulus intervals.

1 13. The method of claim 1, wherein said convergent process comprises a staircase
2 function.

1 14. The method of claim 1, wherein said convergent process comprises a maximum
2 likelihood procedure.

1 15. The method of claim 12, wherein said convergent process comprises selecting a
2 first stimulus in response to said base line threshold, producing a subsequent stimulus that is
3 reduced in magnitude by a step amount if the response in the interaction identifies a correct
4 interval a number X times, or to cause the device to generate a stimulus that is increased in
5 magnitude by a step amount if the response in the interaction identifies an incorrect interval a
6 number Y times.

16. The method of claim 15, wherein the number X equals 3, and the number Y equals 1.

17. The method of claim 15, wherein the number X equals 1, and the number Y equals 1 during an initial part of the test, and wherein at least one of the number X and the number Y is changed to a value greater than 1 during a subsequent part of the test.

18. The method of claim 15, wherein N equals 2, and the number X equals 3, and the number Y equals 1.

19. The method of claim 12, wherein the N is in the range of 2 to 4.

20. The method of claim 12, wherein said convergent process comprises:
selecting a first stimulus in response to said base line threshold, producing a subsequent stimulus that is reduced in magnitude by a first downward step amount if the response in the interaction identifies a correct interval a number X times, or producing a subsequent stimulus that is increased in magnitude by a first upward step amount if the response in the interaction identifies an incorrect interval a number Y times; and
after a number A of reversals of direction of the step direction, producing a subsequent stimulus that is reduced in magnitude by a second downward step amount if the response in the interaction identifies a correct interval a number X times, or producing a subsequent stimulus that is increased in magnitude by a second upward step amount if the response in the interaction identifies an incorrect interval a number Y times, wherein either the second downward step amount is less than the first downward step amount, or the second upward step amount is less than the first upward step amount, or both the second downward step amount is less than the first downward step amount, and the second upward step amount is less than the first upward step amount.

21. The method of claim 1, wherein said interaction comprises an N-alternative forced choice interaction, and said convergent process comprises a staircase function.

1 22. An apparatus comprising:
 2 a data processor which executes instructions;
 3 a communication interface coupled to the processor; and
 4 memory coupled to the data processor which stores instructions in a form readable by the
 5 data processor, the instructions specifying processes which
 6 establish a communication channel with a remote device via the communication
 7 interface; and
 8 manage presentation of an interaction with a test subject via an interface on the
 9 remote device, and adaptively selects stimuli based upon said interaction to be produced at the
 10 remote device for said interaction according to a convergent process to determine a hearing
 characteristic.

23. The apparatus of claim 22, wherein said interaction comprises an N-alternative
 forced choice interaction.

24. The apparatus of claim 22, wherein the communication channel comprises a link
 via a packet switched network.

25. The apparatus of claim 22, wherein the communication channel comprises a link
 via a network executing according a standard internet protocol.

26. The apparatus of claim 22, wherein the communication channel comprises a
 connection according to a standard transmission control protocol over a standard internet
 protocol (TCP/IP).

27. The apparatus of claim 22, wherein the communication channel comprises a link
 through a cellular telephone network.

28. The apparatus of claim 22, wherein the communication channel comprises a link
 through a pager network.

29. The apparatus of claim 22, wherein the remote device comprises a mobile phone.

1 30. The apparatus of claim 22, wherein the remote device comprises a home
2 computer.

1 31. The apparatus of claim 22, wherein the remote device comprises a hand held
2 computing platform.

1 32. The apparatus of claim 22, wherein said processes which manage presentation of
2 said interaction include:

3 logic providing graphic constructs for display at the device corresponding to each of N
4 alternative stimulus intervals, the graphic constructs being aligned in an up and down
5 relationship, causing generation of a selected stimulus during one of the N alternative stimulus
6 intervals, and prompting the subject to make a choice by selecting a graphic construct using an
7 input device indicating the user's perception of the stimulus during said N alternative stimulus
8 intervals.

1 33. The apparatus of claim 22, wherein said processes which manage presentation of
2 said interaction include:

3 causing a visual effect at the device corresponding to each of N alternative stimulus
4 intervals, causing generation of a selected stimulus during one of the N alternative stimulus
5 intervals, and prompting the subject to make a choice by selecting a visual effect indicating the
6 user's perception of the stimulus during said N alternative stimulus intervals.

1 34. The apparatus of claim 22, wherein said convergent process comprises a staircase
2 function.

1 35. The apparatus of claim 22, wherein said convergent process comprises a
2 maximum likelihood procedure.

1 36. The apparatus of claim 33, wherein said convergent process comprises selecting a
2 first stimulus in response to said base line threshold, producing a subsequent stimulus that is
3 reduced in magnitude by a step amount if the response in the interaction identifies a correct

interval a number X times, or to cause the device to generate a stimulus that is increased in magnitude by a step amount if the response in the interaction identifies an incorrect interval a number Y times.

37. The apparatus of claim 36, wherein the number X equals 3, and the number Y equals 1.

38. The apparatus of claim 36, wherein the number X equals 1, and the number Y equals 1 during an initial part of the test, and wherein at least one of the number X and the number Y is changed to a value greater than 1 during a subsequent part of the test.

39. The apparatus of claim 36, wherein N equals 2, and the number X equals 3, and the number Y equals 1.

40. The apparatus of claim 33, wherein the N is in the range of 2 to 4.

41. The apparatus of claim 33, wherein said convergent process comprises:
 selecting a first stimulus in response to said base line threshold, producing a subsequent stimulus that is reduced in magnitude by a first downward step amount if the response in the interaction identifies a correct interval a number X times, or producing a subsequent stimulus that is increased in magnitude by a first upward step amount if the response in the interaction identifies an incorrect interval a number Y times; and
 after a number A of reversals of direction of the step direction, producing a subsequent stimulus that is reduced in magnitude by a second downward step amount if the response in the interaction identifies a correct interval a number X times, or producing a subsequent stimulus that is increased in magnitude by a second upward step amount if the response in the interaction identifies an incorrect interval a number Y times, wherein either the second downward step amount is less than the first downward step amount, or the second upward step amount is less than the first upward step amount, or both the second downward step amount is less than the first downward step amount, and the second upward step amount is less than the first upward step amount.

1 42. The apparatus of claim 22, wherein said interaction comprises an N-alternative
2 forced choice interaction, and said convergent process comprises a staircase function.

1 43. The apparatus of claim 22, wherein said processes include routines for
2 downloading a software component to the remote device used during said interaction.

1 44. A method for remotely testing hearing using a consumer electronics device
2 having a communication interface, an audio stimulus generator and an input device, comprising:
3 remotely establishing a base line threshold for a control signal supplied via the
4 communication interface causing the device to generate a sound;
5 remotely managing an N-alternative forced choice stimulus and response interaction to
6 the subject; and
7 adaptively producing signals to induce selected stimuli at the device for said interaction
8 according to a convergent process based upon said base line threshold and said interaction to
9 determine a hearing characteristic.

1 45. The method of claim 44, wherein said remotely managing includes:
2 providing graphic constructs for display at the device corresponding to each of N
3 alternative stimulus intervals, the graphic constructs being aligned in an up and down
4 relationship, causing generation of a selected stimulus during one of the N alternative stimulus
5 intervals, and prompting the subject to make a choice by selecting a graphic construct using an
6 input device indicating the user's perception of the stimulus during said N alternative stimulus
7 intervals.

1 46. The method of claim 44, wherein said remotely managing includes:
2 causing a visual effect at the device corresponding to each of N alternative stimulus
3 intervals, causing generation of a selected stimulus during one of the N alternative stimulus
4 intervals, and prompting the subject to make a choice by selecting a visual effect indicating the
5 user's perception of the stimulus during said N alternative stimulus intervals.

1 47. The method of claim 44, wherein said convergent process comprises a staircase
2 function.

1 48. The method of claim 44, wherein the convergent process comprises a maximum
2 likelihood procedure.

1 49. The method of claim 44, wherein said convergent process comprises selecting a
2 first stimulus in response to said base line threshold, producing a subsequent stimulus that is
3 reduced in magnitude by a step amount if the response in the interaction identifies a correct
4 interval a number X times, or to cause the device to generate a stimulus that is increased in
5 magnitude by a step amount if the response in the interaction identifies an incorrect interval a
6 number Y times.

1 50. The method of claim 49, wherein the number X equals 3, and the number Y
2 equals 1.

1 51. The method of claim 49, wherein the number X equals 1, and the number Y
2 equals 1 during an initial part of the test, and wherein at least one of the number X and the
3 number Y is changed to a value greater than 1 during a subsequent part of the test.

1 52. The method of claim 49, wherein N equals 2, and the number X equals 3, and the
2 number Y equals 1.

1 53. The method of claim 44, wherein the N is in the range of 2 to 4.

1 54. The method of claim 44, wherein said convergent process comprises:
2 selecting a first stimulus in response to said base line threshold, producing a subsequent
3 stimulus that is reduced in magnitude by a first downward step amount if the response in the
4 interaction identifies a correct interval a number X times, or producing a subsequent stimulus
5 that is increased in magnitude by a first upward step amount if the response in the interaction
6 identifies an incorrect interval a number Y times; and
7 after a number A of reversals of direction of the step direction, producing a subsequent
8 stimulus that is reduced in magnitude by a second downward step amount if the response in the
9 interaction identifies a correct interval a number X times, or producing a subsequent stimulus

10 that is increased in magnitude by a second upward step amount if the response in the interaction
11 identifies an incorrect interval a number Y times, wherein either the second downward step
12 amount is less than the first downward step amount, or the second upward step amount is less
13 than the first upward step amount, or both the second downward step amount is less than the first
14 downward step amount, and the second upward step amount is less than the first upward step
15 amount.

1 55. The method of claim 44, wherein said remotely establishing comprises
2 communication via a communication network.

1 56. The method of claim 44, wherein said remotely managing comprises
2 communication via a communication network.

1 57. The method of claim 44, including downloading a software component from a
2 server to the remote device which upon execution supports said method.